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Description

A method, process and computer program to automatically create a customized three-dimensional nail object by welding

Cross Reference to Related Applications

[0001] This application references U.S. patent application Serial No. 10/708,065, filed Feb. 6, 2004.

Background of Invention

[0002] While working with fingernails and fingernail objects for several years, there was no easy way to automatically create a three-dimensional model of an artificial fingernail object. In fact, most software in the market allows a user to manually manipulate and create just about any three-dimensional object conceivable, but the process of doing this manually is very time consuming and allows for too much human error when creating artificial fingernails with a consistent and reliable appearance. Because of this the

inventors set out to find a method to create artificial fingernail objects automatically and this invention was the result.

[0003] One simple way to create the desired artificial nail object is to imitate the existing Artificial Nail Industry. Currently, when a consumer wants an artificial fingernail applied, they will have a preexisting nail tip attached (by glue or acrylic) to their natural nail and then the nail technician will hand build the rest of the artificial fingernail with an acrylic or some other similar type product, where the final result is a desired, beautiful artificial fingernail. By creating a variety of three-dimensional tips similar to that of the existing market, the inventors were able to successfully imitate the nail technician process. The problem to overcome was to determine the rest of the desired three-dimensional fingernail object as at this point in the process a bottom surface and tip existing, but a remaining top surface that was blended with the tip needed to be generated. To solve this problem, the inventors decided to duplicate the three-dimensional representation of the clients existing nail surface and then apply a smoothing and blending function to this surface, and then attach it to the nail tip, resulting in the desired three-dimensional ar-

tificial fingernail object.

[0004] The advantage of this invention is that with relative ease and very little labor a desired customized and preferred three-dimensional artificial nail object can be created. This invention has many applications, particularly with fingernail and toenails. This new desired three-dimensional object has many applications, not the least of which is the ability to physically create the nail object for the individual and supply them with an artificial nail for use as a cosmetic or even prosthesis. The invention can now safe time and virtually guarantee consistent looking fingernail objects, all accomplished with relative ease.

Summary of Invention

[0005] The invention is a method, process and computer program to automatically create a customized three-dimensional artificial nail object by welding based upon an actual/existing digitized nail surface. This particular invention generates the overall desired three-dimensional nail object by taking the digitized nail surface and welding it to a preexisting desired nail tip thus creating a preferred artificial nail object. The application of the invention results in a wide scope of possible implementations including a use for creating artificial fingernails and artifi-

cial toenails.

Brief Description of Drawings

[0006] Fig. 1 is a diagram demonstrating the Axis, periphery and digitizing of the nail surface object.

[0007] Fig. 2 is a diagram illustrating the tip selection process, welding the tip to the duplicated nail surface.

[0008] Fig. 3 is a diagram showing the welding of the selected tip, duplicated nail surface and the digitized nail surface.

[0009] Fig. 4 is a diagram showing the new customized nail object fitting over the digitized surface.

Detailed Description

[0010] By starting with an existing digitized three-dimensional surface point array of an actual fingernail or toenail, the invention permits the automatic creation of a new customized three-dimensional object that will fit over the actual fingernail or toenail. This is accomplished by measuring key points of data contained in the digitized array. The key points are measurement values in millimeters or inches along the X-axis, Y-axis and Z-axis. Further, the arcs and curves of the digitized nail surface are also determined along the X-axis and Y-axis. Additional key points are found in the periphery points along the tip of

the digitized nail surface.

[0011] Once the key points are evaluated, a selection process is handled whereby preexisting representations of three-dimensional nail tips are compared and the best fitting nail tip that also represents the desired overall appearance is then manipulated and utilized.

[0012] In order to successfully create the desired customized nail object an additional top surface must be created. This is achieved by duplicating the digitized nail surface and raising the duplicated surface along the Z-axis to a desired depth. In many cases the digitized nail surface will need to be smoothed and blended to match the selected nail tip. Smoothing is achieved by comparing each data point in the array of points contained in the duplicated nail surface and verifying that each point falls within a specified acceptable range of the smoothing function. If a point falls outside the range, then it is changed along its X-axis, Y-axis or Z-axis accordingly. Blending occurs in much the same way but is focused on the intersection points between the selected nail tip and the duplicated top surface.

[0013] Once the duplicated nail surface has been created all three objects are then combined to form one new preferred and

desired three-dimensional nail object. This is achieved by aligning the duplicated surface to the top of the selected nail tip, this is then combined with the digitized nail surface and aligned along the bottom of the selected nail tip with the digitized nail surface to form the bottom of the new nail object. The result is a new customized three-dimensional nail object that has the desired appearance and will fit over the digitized nail surface.

[0014] In Fig. 1 the first step of the process is demonstrated, where a *digitized nail surface* 100 is shown and the orientation of the X, Y and Z Axis is established. Here the *X-axis* 110 is found along the width of the *digitized nail surface* 100; the *Y-axis* 120 is the length of the *digitized nail surface* 100 and can be determined initially by measuring from the cuticle to the tip of the *digitized nail surface* 100; and the *Z-axis* 130 represents the height or depth of the *digitized nail surface* 100. Additionally, the *periphery points* 140 of the tip of the digitized nail surface 100 are also determined in the first step to insure that the *digitized nail surface* 100 dimensions will fit into the *selected tip object* 210. All of these reference points are utilized in the selection process for the *selected tip object* 210, which will eventually be manipulated to create the new three-dimensional data

representing the final three-dimensional *customized nail object* 400.

[0015] Measuring the digitized surface area includes creating a relationship of the *X-axis* 110, *Y-axis* 120 and *Z-axis* 130 to millimeters or inches, further arcs and curves of the *digitized nail surface* 100 are determined by measuring and creating relationships between the three-dimensional points of data along the *X-axis* 110, *Y-axis* 120 and *Z-axis* 130. These curves and arcs are utilized and manipulated during the smoothing process and during the *tip selection* 210 process, in an effort to make the *combined top surface* 200.

[0016] By utilizing the *periphery points* 140 along the tip of the *digitized nail surface* 100 as reference points, the selection of the *preferred tip object* 210 is facilitated.

[0017] Once the *tip object* 210 is selected, then the *digitized nail surface* 100 is duplicated to create an eventual top surface.

[0018] The *duplicated nail surface* 220 is raised on its *Z-axis* 130 to a determined depth so as to create a preferred depth to the *customized nail object* 300. Often, the *duplicated nail surface* 220 will require smoothing to insure the appearance of the *top surface* 200 is desired. The smoothing process is achieved by comparing points along the *X-axis* 110, *Y-axis* 120 and *Z-axis* 130 to its surrounding points and if a point

falls outside the preferred range, that point is manipulated accordingly to the smoothing function and brought into the scope of its surrounding points in three-dimensional space.

[0019] Once the *duplicated nail surface* 220 has been smoothed, it will be attached to the top surface of the *selected tip object* 210. The intersection between the two objects will often need to be blended. The blending process operates much in the same way as the smoothing process in that the corresponding points of the intersection are compared and if the intersecting points fall outside of a desired range, they are manipulated to be in harmony with the desired range and thus blending the *duplicated nail surface* 220 with the *selected tip object* 210. This results in a *combined top surface* 200 that will be added too by the *digitized nail surface* 100 in the next step.

[0020] Fig. 3 shows the combination of the *combined top surface* 200 with the *digitized nail surface* 100 thus creating a *new customized nail object* 300. This combination occurs by aligning the bottom of the *selected tip object* 210 with the bottom of the *digitized nail surface* 100. Once all three objects (*duplicated nail surface* 220, *selected tip object* 210 and *digitized nail surface* 100) are properly aligned, smoothed

and blended, they are combined to form a *new customized nail object* 300.

[0021] Fig. 4 shows the *new customized nail object* 300 as one *customized nail object* 400, fitting over the top of the original *digitized nail surface* 100.

[0022] By completing the steps above, virtually any software program or user would be capable of creating a desired and customized three-dimensional artificial nail object. The entire objective of the preferred embodiments of the invention has been to create a simplified method, process and computer program to automatically create a customized three-dimensional nail object by welding preexisting nail tips with an existing nail surface into a preferred artificial nail object. The application of this invention is extensive and plentiful, as with this invention it will become trivial to generate desired three-dimensional artificial nail objects by automation quickly and easily. Because of the advantages inherent in this invention it is anticipated that many variants of this invention are possible, which should be included within the preferred embodiments and descriptions of this invention.